



ENERGY STAR® Certified Manufactured Homes Program, Version 2

Guide for Home Manufacturers



SECOND EDITION
Effective December 11, 2020

What's New in this Edition

This second edition of the ENERGY STAR® Certified Manufactured Homes Program, Version 2 Guide for Home Manufacturers contains clarifications, elaborations, and some revisions to the program requirements. Some of the more significant changes to the requirements and where they may be found in this edition are highlighted in the table below.

Provision	Revision	Page
<p>National Program Requirements Table 2. Other Mandatory Requirements</p>	<ul style="list-style-type: none"> • Clarified and elaborated items listed in Building Thermal Envelope Air Sealing section, emphasizing goal of achieving a continuous air barrier • Added windows to list of envelope components • Provided sealing requirements based on choice of air barrier at the floor (i.e., decking or bottom liner) • Clarified that sealing can be on the interior or exterior of walls, so long as it is continuous • Added language about requirements for sealing: <ul style="list-style-type: none"> – at ceiling-to-wall interface – windows and doors to the walls – doors opening to unconditioned spaces • Added requirement that wood burning fireplaces, if present, must use air-tight, gasketed doors 	2.3
<p>Routine Production Requirements for Maintaining Active Status</p>	<ul style="list-style-type: none"> • Moved Step 5. Facilitate 2% Field Evaluations into new section addressing requirements for maintaining active status in program • Clarified definition of exterior ductwork • Added requirement for plants to maintain active status; see Periodic-In Plant Reviews • Defined inactive plant status 	3.2
<p>Certifying the Plant Step 4. Manufacture, Install and Inspect Three Qualification Homes</p>	<ul style="list-style-type: none"> • Clarified that the initial plant qualification homes may be set up at the plant, and do not necessarily have to be produced consecutively 	4.1

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This guide is the Systems Building Research Alliance (SBRA) roadmap for designing, producing and installing homes to the ENERGY STAR® Certified Manufactured Homes **Version 2** program requirements. Homes produced on or after June 1, 2020 must be certified according to Version 2.

What is ENERGY STAR?

ENERGY STAR® is a nationally recognized, voluntary program designed to identify and promote energy-efficient products, new homes, and buildings to consumers and businesses across the United States. ENERGY STAR affords the manufactured housing industry a unique opportunity to extend the advantages of controlled-environment factory production to include exemplary energy performance. An ENERGY STAR certified manufactured home is a home that has successfully met all technical and quality control requirements as set forth in this guide.

An ENERGY STAR certified manufactured home is significantly more energy efficient in its heating and cooling than a comparable home built to the federal Manufactured Home Construction and Safety Standards (commonly referred to as the HUD Code) contained in 24 CFR 3280. This increased level of energy efficiency can be met using standard technologies and manufacturing practices by successfully integrating three key home components:

- An energy-efficient building envelope (e.g., effective insulation, high-performance windows, and tight construction),
- Energy-efficient space heating and cooling equipment, and
- Energy-efficient air distribution (e.g., air-tight, well-insulated ducts).

Quality Assurance Oversight

EPA designated SBRA to serve as a ‘Quality Assurance Provider’ (QAP) for the ENERGY STAR Manufactured Home Program. SBRA is responsible for developing plant certification procedures, for the oversight and enforcement of all quality assurance requirements related to designing, producing and installing ENERGY STAR homes, and for reporting to EPA all certified homes as well as any issues of non-compliance. SBRA works with third parties called ENERGY STAR “Certifiers” in fulfilling these responsibilities.

Participating in the Program

1. Become an ENERGY STAR Partner

Prior to certifying homes as ENERGY STAR, each manufactured housing plant must submit its own ENERGY STAR Partnership Agreement, available at www.energystar.gov/homesPA. Successful completion of the plant certification process outlined in Chapter 4 qualifies the plant as a Partner with the authorization to produce ENERGY STAR certified manufactured homes. The plant representative will receive information regarding the partnership by e-mail, including access to ENERGY STAR logos and promotional marks for use in marketing.

Partners must complete at least one ENERGY STAR certified home every 12 months to maintain their “active” ENERGY STAR Partner status. Only “active” Partners can use the ENERGY STAR logo. If 12 months elapse without the plant labeling an ENERGY STAR certified home, the partner’s status is changed to “inactive”. Active status is automatically restored when the plant resumes production and reporting of ENERGY STAR homes.

2. Certify the Plant

Plants must first be certified before producing ENERGY STAR homes on an ongoing basis. Plant certification must be performed by a third-party consultant called an ENERGY STAR Certifier who has met established requirements for training and credentials. The plant certification process is described in Chapter 4.

3. Build ENERGY STAR Homes

Once a plant has been certified, it can build and sell ENERGY STAR homes.¹ This involves applying manufacturing, inspection, and quality control procedures developed during the certification process. The ENERGY STAR technical requirements are presented in Chapter 2 and the steps in producing ENERGY STAR homes are covered in Chapter 3.



More Information

Additional information about ENERGY STAR for Manufactured Homes is available SBRA's web site at www.research-alliance.org.

¹ Manufactured homes designed and produced in the plant to meet the ENERGY STAR requirements are only “ENERGY STAR certified” after they are installed at a customer’s site. Homes cannot be marketed or promoted as “ENERGY STAR labeled”, “ENERGY STAR certified”, or in any way that implies a home has met ENERGY STAR requirements, until the home is complete. Use of the ENERGY STAR brand by a Partner to falsely market or promote a home as ENERGY STAR may result in suspension or expiration of the Partner’s participation in the ENERGY STAR program.

This section details the design and construction requirements for complying homes under Version 2 of the ENERGY STAR Certified Manufactured Home National Program Requirements.

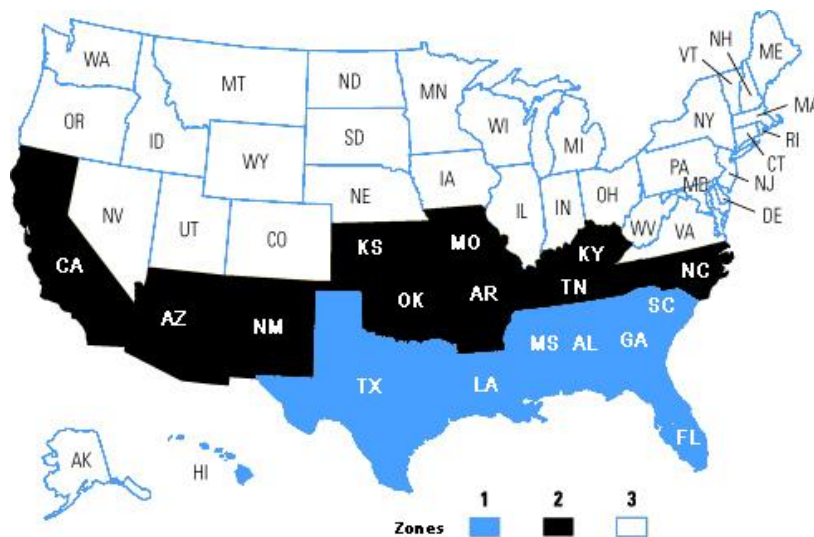
Determining ENERGY STAR Requirements

The ENERGY STAR requirements fall into two groups. The first group includes **Thermal Envelope and Mechanical Equipment** requirements. These requirements are listed on Table 1 and vary by HUD thermal zone. The second group, **Other Mandatory Requirements**, includes features required of all homes in all locations.

To determine the requirements for an ENERGY STAR manufactured home, follow these steps:

1. From Table 1, identify the thermal zone where the home will be sited²,
2. Each row on the table represents one package of envelope and equipment specifications. For each thermal zone (see map below), there are three package options:
 - a. **EHP**—electrically heated home with an air-source heat pump and backup heat.
 - b. **GAS**—natural gas- or propane-heated home with a high efficiency furnace.
 - c. **ENV**—higher insulation levels, but no specific equipment requirements.

Select the desired package. Note that compliance can be demonstrated by meeting either the prescriptive component insulation **R-value** requirements OR by meeting the maximum envelope **U_o-value**. The equipment efficiency requirements for each package are listed in the last two columns, for heating and cooling, respectively.



HUD Thermal Zone Map

3. All homes must comply with the requirements listed under Other Mandatory Requirements.

² Where the destination of a home is not known prior to manufacture, and the plant’s typical shipping radius covers more than one zone, it is advisable to select an ENERGY STAR package from the zone with the more stringent thermal envelope requirements.

Table 1. ENERGY STAR Version 2 Design Packages

HUD Zone ¹	Pkg. ID ²	Building Thermal Envelope ³						Mechanical Equipment	
		Min. Insulation R-value ⁴			Max. Glazing U-value ⁵	Max. U _o -value ⁶		Min. Efficiency ⁷	
		Ceiling	Walls	Floor		Single-section	Multi-section	Heating	Cooling
1	1-EHP	33	11	22	0.35	0.080	0.074	Heat pump ⁸	
	1-GAS	33	11	22	0.35	0.080	0.074	90 AFUE	NR
	1-ENV	38	13	22	0.34	0.076	0.071	NR	NR
2	2-EHP	33	11	22	0.35	0.080	0.074	Heat pump ⁸	
	2-GAS	33	11	22	0.35	0.080	0.074	95 AFUE	NR
	2-ENV	38	19	22	0.34	0.067	0.064	NR	NR
3	3-EHP	33	11	22	0.35	0.079	0.074	Heat pump ⁸	
	3-GAS	38	13	30	0.35	0.071	0.065	95 AFUE	NR
	3-ENV	40	21	33	0.34	0.059	0.056	NR	NR

Table References

- 1. HUD Zone:** Thermal Zone boundaries as established by the U.S. Department of Housing and Urban Development Code contained in 24 CFR 3280.
- 2. Package ID:** This code identifies the compliance package selected.
- 3. Building thermal envelope:** Qualifying the home’s thermal envelope for ENERGY STAR is demonstrated in one of two ways: either by meeting or exceeding the prescriptive requirements (minimum insulation R-values and maximum glazing U-value, see notes 4 and 5) **OR** by meeting the maximum envelope U_o-value (see note 6).
- 4. Minimum insulation R-value:** Refers to the nominal, uncompressed R-value of the insulation only.
- 5. Maximum glazing U-value:** Applies to windows, skylights and glazed doors (defined as door area that is ≥ 50% glazed). The target U-value is an area-weighted average value of all glazed components (windows, skylights and glazed doors).
- 6. Maximum U_o-value:** The overall envelope coefficient of heat transmission (U_o value) as defined in 24 CFR 3280.508 and 3280.509.
- 7. Minimum heating and cooling equipment efficiency:** The rated seasonal efficiency of the equipment used for space heating and cooling available from the OEM equipment manufacturer, the equipment distributor and the Air Conditioning, Heating, and Refrigeration Institute (AHRI) Directory of Certified Product Performance (ahridirectory.org). **NR denotes “no requirement”.**
- 8. Heat pump:** Requires installation of an air-source heat pump that meets current minimum federal efficiency requirements, with electric or dual-fuel backup.

Table 2. Other Mandatory Requirements

General Requirements

- **Solar Heat Gain Coefficient:** Glazing Solar Heat Gain Coefficient (SHGC) ≤ 0.34 . The target SHGC is an area-weighted average value for windows, skylights and glazed doors (door area that is $\geq 50\%$ glazed).
- **Thermostats:** Thermostats controlling the operation of space heating and cooling equipment shall be programmable.
- **Ducts (internal):** Ducts in floor cavities shall be on the conditioned side of the floor insulation. Ducts in attics shall be fully buried in attic insulation.
- **Ducts (external):** Crossover ducts and other ducts in unconditioned space shall be wrapped with insulation rated at R-8 or greater.
- **Marriage line seal:** For multi-section homes only, the marriage line areas must be filled with a continuous, non-porous gasket creating a continuous air barrier in the ceiling, walls and floor. Acceptable materials can be one- or two-part systems, including proprietary gaskets, foams, insulation wrapped in poly and insulation covered by butyl or other long-life tape on one side. There should be no visible gaps or tears. The marriage line seal shall be installed at the plant and be protected against damage during shipping.

Building Thermal Envelope Air Sealing

All joints, seams, and penetrations associated with the building thermal envelope are sealed against air leakage in accordance with the manufacturer's installation instructions, such that a **continuous air barrier** is established upon installation of all envelope components (i.e., ceiling, walls, windows, doors and floor), including:

- At minimum, gaps created by thermal envelope penetrations—including ducts, flue shafts, plumbing, piping, electrical wiring, receptacles, switches, bathroom and kitchen exhaust fans, and recessed lighting fixtures adjacent to unconditioned space and light tubes adjacent to unconditioned space—must be sealed using caulk, foam or gasket, or other suitable material.
- Sealing can be on the interior or exterior of walls, so long as it is continuous.
- The air barrier at the floor can be either at the decking or at the bottom liner. If decking: All openings and penetrations in the floor, including at traps under tubs and showers, must be sealed. If bottom liner: All penetrations in the bottom board must be sealed (including those made in the field), and the perimeter of the liner must be sealed with durable material where it is fastened to the floor framing.
- Ceiling-to-wall interface must be sealed using caulk, gasket or other method, along the entire perimeter of the home.
- Windows and doors must be sealed to the walls with durable material.
- Attic access panels, drop-down stairs and doors to unconditioned spaces must be equipped with gaskets or weatherstripping (i.e., not caulked) to produce a continuous air seal.
- If present, wood burning fireplaces must use air-tight, gasketed doors.

Sealing methods between dissimilar materials must allow for differential expansion and contraction.

Duct Sealing

Duct systems must be sealed against air leakage in accordance with the duct manufacturer's installation instructions and the following provisions:

- All metal ducts and fittings shall be sealed. For glass fiberboard ducts, the manufacturer's sealing instructions shall be followed. Sealants are in addition to mechanical fastening (if used).
- Connections and routing of manufacturer installed ductwork completed without kinks or sharp bends that would significantly impede air flow.
- Flexible ducts in unconditioned space not installed in cavities smaller than outer duct diameter; in conditioned space not installed in cavities smaller than inner duct diameter.

Duct Installation

The crossover ducts must be installed such that all seams and joints are tightly sealed against leakage and the ducts do not rest on the ground.

A couple of additional points about meeting the program requirements:

- ENERGY STAR certified manufactured homes do not require the use of ENERGY STAR certified windows or appliances, nor does the use of ENERGY STAR certified windows or appliances help a home qualify as ENERGY STAR.
- Certification of a manufactured home to meet ENERGY STAR program requirements is not intended to imply compliance with applicable codes. In cases where requirements of the federal or local codes or manufacturers' installation instructions conflict with ENERGY STAR program requirements the code shall govern. In such cases, the homes may not be certified unless the EPA-recognized Quality Assurance Provider has determined that no equivalent option is available that could meet the intent of the conflicting requirement.

This chapter describes the typical, routine process plants follow in qualifying homes for the ENERGY STAR label and other requirements for maintaining active status in the program.

Step 1. Manufacture and Inspect Homes in the Plant

The plant manufactures homes in accordance with the requirements described in Chapter 2. The homes are inspected by the plant’s third-party, in-plant inspection agency (IPIA). Plant quality control (QC) personnel verify that the ENERGY STAR features are installed in accordance with the Quality Control Manual.

Step 2. Verify the Heat Pump Sale and Installation (applies to Heat Pump package only)

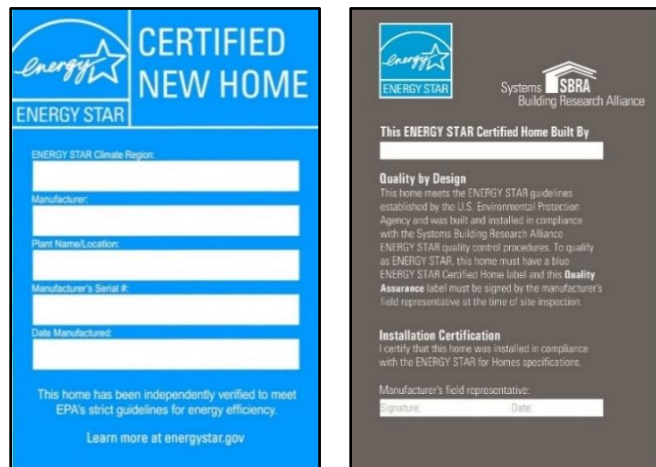
If one of the heat pump design packages are selected (**1-EHP, 2-EHP or 3-EHP**), the condenser and evaporator coil brand and model number must be recorded in the home’s *Information Manager* (IM) record. Plants are responsible for collecting and keeping on file proof of the heat pump sale and installation. Proof of the heat pump sale and product information can be obtained in several ways, including:

- Copy of the customer sales invoice containing the heat pump information, or
- Completed **Heat Pump Tracking Sheet** usually provided by the retailer or equipment seller (distributor or installer). The Heat Pump Tracking Sheet is available on SBRA’s web site at: www.research-alliance.org/Heat_Pump_Tracking_Sheet.pdf or,
- Other sources that document the heat pump sale that can be verified.

As part of program quality assurance oversight, SBRA will collect and verify documentation for a sample of 10% of completed homes using the Electric Heat Pump package. Plants are responsible for providing this documentation to SBRA upon request.

Step 3. Complete and Affix the ENERGY STAR and the Quality Assurance Labels

Every ENERGY STAR manufactured home must have affixed to it a blue ENERGY STAR Certified New Home label and a gray SBRA Quality Assurance (QA) label. The ENERGY STAR label functions as a certification mark for compliance with ENERGY STAR’s energy efficiency requirements. The Quality Assurance label is required by the Quality Assurance Provider and certifies that the home was built and installed under the manufacturer’s quality assurance program in conformance with the program requirements.



ENERGY STAR Certified New Home and SBRA QA Labels

Upon successful installation of the home in its final location, the plant completes the ENERGY STAR Certified New Home label and signs the SBRA Quality Assurance label. Use *Information Manager* to print the information provided on the blue ENERGY STAR label.

The plant affixes the labels to the home. Completed labels can be provided to the home retailer or directly to the homeowner along with application instructions. The labels should be permanently affixed to the home, typically placed adjacent to the HUD Data Plate or inside the electric panel cover. The plant is responsible for ensuring that all homes receiving these labels meet ENERGY STAR requirements when installed in their final location.

Both the EPA ENERGY STAR Certified New Home label and the SBRA Quality Assurance label are obtained from SBRA. To obtain labels, visit www.research-alliance.org/LabelOrderForm.pdf.

Step 4. Complete Home Record in *Information Manager*

Following home installation and completion of the ENERGY STAR measures, the manufacturing plant completes the home's record in *Information Manager*. All supporting documentation must be retained by the plant and available for inspection by SBRA and the plant's Certifier.

Requirements for Maintaining Active Status

To maintain *active* status in the ENERGY STAR Manufactured Homes program, plants must coordinate with the Certifier on the following requirements:

- **Field Evaluations:** Each calendar year, field evaluations must be conducted by the Certifier on no less than two percent (or a minimum of one home, whichever is greater) of a plant's ENERGY STAR certified homes that incorporate a **site-installed heat pump** and/or **exterior ductwork**. Exterior ductwork is defined as any ducts or duct connections that are installed outside the conditioned space, including crossover ducts running under the belly of the home and ducts running outside the conditioned envelope in attics.
- **Periodic-In Plant Reviews:** The Certifier is required to visit the manufacturing plant at least once per calendar year to verify on-going compliance with ENERGY STAR requirements and procedures. These periodic in-plant visits entail reviewing with plant staff any changes to program technical requirements or compliance verification procedures; reviewing any changes needed to plant documentation, including DAPIA-approved plans, QC manuals/travelers, Manufacturer's Installation Manual, and heat pump documentation for electric heat pump homes; and, verifying that filed documents correspond to home records in *Information Manager*.

A plant is considered *inactive* if the plant has not completed at least one home in 12 consecutive months and has not completed the annual in-plant review with the Certifier. An inactive plant may become active again by completing the periodic in-plant review with the Certifier and building and completing one home.

This chapter describes the initial process of certifying a home manufacturing plant to be eligible to build ENERGY STAR manufactured homes.

Step 1. Retain a Manufactured Housing ENERGY STAR Certifier

The first step in the certification process is for the plant to hire an independent, third-party consultant, called a Manufactured Housing ENERGY STAR Certifier, who will certify that the plant's home designs meet ENERGY STAR requirements and periodically evaluate ongoing compliance. An ENERGY STAR Certifier must be accredited by SBRA. A list of Certifiers is available at www.research-alliance.org/pages/es_cert_side.htm.

Step 2. Design Homes to Meet ENERGY STAR Requirements

The next step is for the plant to create home designs that meet ENERGY STAR requirements as detailed in Chapter 2. The plant Certifier will verify that the plant understands and is capable of building homes that comply with the ENERGY STAR requirements.

Step 3. Incorporate Requirements into Quality Control and Inspection Procedures³

Information about the ENERGY STAR features in the new home designs must be incorporated, as appropriate, into the plant's Design Approval Primary Inspection Agency (DAPIA)-approved packages, the plant Quality Control Manual, and the Manufacturers' Installation Manual. Specifically, the Installation Manual shall include guidance for completing the crossover duct field installation (multi-section homes only), as described in: www.research-alliance.org/CrossoverDuctInstallationRequirements.pdf.

Step 4. Manufacture, Install and Inspect Three Qualification Homes

As part of the plant certification process, a plant must build three (3) homes that meet ENERGY STAR requirements. The homes should be representative of the range of "energy profile types" produced by the plant as defined by the Certifier. For example, homes with ducts located in the attic and homes with ducts located in the floor could be defined by the Certifier as different "types," as would single- and multi-section homes. The qualification homes may be set up at the plant, and do not necessarily have to be consecutive.

Step 5. Incorporate ENERGY STAR Practices into Routine Operations

Once the three certification homes have been installed successfully, the plant must take steps to transfer the lessons learned from the process into its routine production of ENERGY STAR certified homes, including:

- Instruct key plant personnel on the critical processes and procedures for designing and manufacturing new ENERGY STAR certified homes;
- Provide instructions for set-up crews on how to correctly install ENERGY STAR certified homes in the field; and,
- Review all documentation verifying that the plant is maintaining complete records of ENERGY STAR home completions.

³ This step is a new part of the plant certification process that must be adopted by all plants, including plants previously certified.

Step 6. Establish SBRA ENERGY STAR Information Manager Account

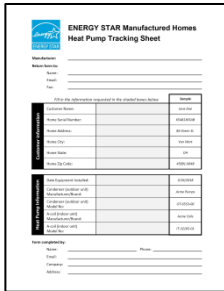
Once certified, the plant should contact SBRA to establish the plant's ENERGY STAR *Information Manager* (IM) account. The plant is responsible for recording information about their ENERGY STAR production in their account.

Note: SBRA may rescind a plant's certification if they determine that the plant is not in conformance with the program rules or is compromising the integrity of the ENERGY STAR brand.



Crossover Duct Installation Requirements

www.research-alliance.org/CrossoverDuctInstallationRequirements.pdf



Heat Pump Tracking Sheet

www.research-alliance.org/Heat_Pump_Tracking_Sheet.pdf



ENERGY STAR Manufactured Homes Label Order Form

www.research-alliance.org/LabelOrderForm.pdf